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Effect of Different Salts on Macronutrient and Micronutrient Uptake, Gene Expression, and Growth Pattern of Selected Rice Genotypes

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[Introduction]

Rice (*Oryza sativa* L.) is the main cereal crop worldwide with respect to cultivated area and total production. It provides almost 20% of the world's dietary energy supply. Soil salinity affects agriculture productivity in several regions globally, including Australia, Argentina, China, Egypt, Iran, Iraq, Pakistan, Thailand, and the United States (i.e., an area of >800 million ha; Rengasamy, 2010).

[Materials and Methods]

Seeds of four different rice cultivars, Cheongcheong, Nagdong, IR 28, and Pokkali, were utilized in the experiment. Three different salt solutions of NaCl, $CaCl_2$ and $MgCl_2$ with concentrations of 100, 150, 200, and 250 mM were used for seed germination and seedling analysis of four different rice genotypes.

[Results and Discussion]

This study used $CaCl_2$ and $MgCl_2$ along with NaCl and analyzed their effects on macronutrient and micronutrient uptake, gene expression, seed germination, plant growth, and biomass in different rice genotypes. $CaCl_2$ increased germination percentage and seedling growth, whereas $MgCl_2$ increased root, shoot length, and fresh and dry weight in cultivars IR 28 and Cheongcheong. Agronomic traits were drastically reduced by NaCl stress compared to other salts. Salt stress differentially regulated ion uptake in the roots and shoots. Ca^{2+}, Mn^{2+}, and Fe^{2+} ions consistently decreased in Cheongcheong, Nagdong, and IR 28 roots. A salt stress-related gene was expressed differentially in the roots. *OsHKT1*, *OsNHX1*, and *OsSOS1* were upregulated in Nagdong shoots and in the salt-tolerant cultivar Pokkali roots and shoots. Pokkali responded well to NaCl stress only, whereas Nagdong showed more salt tolerance to different salts.

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